# Appendix 1D
# Section 404(b)(1) Evaluations

# American River Watershed, California
# Long-Term Study

# 404(b)(1) Water Quality Evaluation
# 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

**AMERICAN RIVER WATERSHED, CALIFORNIA**
**LONG-TERM STUDY**

# 404(b)(1) WATER QUALITY EVALUATION
# 3.5-FOOT DAM RAISE/478-FOOT FLOOD POOL ELEVATION

## I. PROJECT DESCRIPTION

### LOCATION

The project alternatives are located in the American river Basin and include Folsom Dam and Reservoir and the land areas immediately adjacent to the reservoir, Lake Natoma, the lower American River channel, the Sacramento and Yolo Bypasses and associated sloughs along the lower Sacramento River.

### GENERAL DESCRIPTION

For the purposes of this project, a variety of potential flood control measures were evaluated, and seven action alternatives were created for detailed evaluation along with the No-Action Alternative. The action alternatives being carried forward are: (1) 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, (2) Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, (3) Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation, (4) Stepped Release to 160,000 cfs, (5) Stepped Release to 160,000 cfs and New Outlet at Folsom Dam, (6) Stepped Release to 180,000 cfs, and (7) Stepped Release to 160,000 cfs and Seven-Foot Dam Raise. The 3.5-Foot Dam Raise alternative is presented here:

### 3.5-FOOT DAM RAISE/478-FOOT FLOOD POOL ELEVATION

- Seal vertical joints in the dam parapet wall.
- Lower the main and emergency spillway crest 6 feet.
- Enlarge L. L. Anderson Dam Spillway.
- Replace all eight spillway radial gates.
- Raise and extend spillway bridge piers.
- Replace spillway bridge with one through traffic lane in each direction.
- Extend stilling basin by 50 feet.
- Construct a 3.5-foot parapet wall on top of all dams and dikes. Extend wall to meet grade (no embankment would be raised).

- Construct a temporary construction bridge to provide a public detour during construction. Following construction traffic would revert to spillway bridge at discretion of the Bureau, and the temporary construction bridge would be removed.

- 10,000 cubic yards of borrow would be taken from the Peninsula site.

- Mooney Ridge - a flowage easement would be obtained from 7-8 landowners in this area, depending on the property boundaries. The foundations of these houses would be strengthened as necessary.

AUTHORITY AND PURPOSE

The basic authority for the overall study is the Flood Control Act of 1962 (Public Law [PL] 87-874), as follows:

> The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and flood aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multipurpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85-500.

Although this authorization applies to the overall study of the American River watershed, specific direction for the current effort is provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (PL 106-53):

**SEC. 566. FOLSOM DAM AND RESERVOIR ADDITIONAL STORAGE AND ADDITIONAL FLOOD CONTROL STUDIES**

(a) FOLSOM FLOOD CONTROL STUDIES-

(1) IN GENERAL - The Secretary, in consultation with the State of California and local water resources agencies, shall undertake a study of increasing surcharge flood control storage at Folsom Dam and Reservoir.

(2) LIMITATIONS - The study of the Folsom Dam and Reservoir undertaken under paragraph (1) shall assume that there is to be no increase in conservation storage at the Folsom Reservoir.

(3) REPORT - Not later than March 1, 200, the Secretary shall transmit to Congress a report on the results of the study under this subsection.

(b) AMERICAN AND SACRAMENTO RIVERS FLOOD CONTROL STUDY -

(1) IN GENERAL - The Secretary shall undertake a study of all levees on the American River and on the Sacramento River downstream and immediately upstream of the confluence of such Rivers to assess opportunities to increase potential flood protection through levee modification.

(2) DEADLINE FOR COMPLETION - Not later than March 1, 2000, the Secretary shall transmit to Congress a report on the results of the study undertaken under this subsection.

Flood control alternatives considered in this study focus on increasing Folsom Dam flood control storage, modifying lower American River and downstream levees, and a combination of modifying lower American River and downstream levees and increasing Folsom Dam storage.

GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

Construction of this alternative would be accomplished primarily in upland areas. About 10,000 cubic yards of borrow material would be needed for general construction activities on top of the dikes and immediately downstream of Folsom Dam where the temporary construction bridge would be placed. Fill material would be excavated from the reservoir at the Peninsula site.

DESCRIPTION OF PROPOSED DISCHARGE SITE(S)

(1) Location. The proposed discharge sites are located in the immediate vicinity of Folsom Dam.

(2) Size. The construction area consists of the tops of the dam as well as the embankment dams and dikes, and a temporary construction bridge about 1 mile long.

(3) Type of Site. All of the work proposed under this alternative would occur in an area that has been developed as flood control facility for at least 40 years.

(4) Type(s) of Habitat. This work will be accomplished in a variety of cover types, primarily upland, but a small area of riparian woodland and oak woodland.

(5) Timing and Duration of Discharge. Construction of this alternative would be completed in about 6 years. Construction could occur year round.

DESCRIPTION OF DISPOSAL METHOD

Concrete to construct the piers and parapet walls would be trucked on to site using local suppliers from the Bradshaw/Kiefer area. Fill material needed for foundation work would be excavated from the Peninsula borrow site and hauled to the work sites around the reservoir and to the temporary construction bridge site. This material would be compacted into place at the work site.

## II. FACTUAL DETERMINATIONS

### a. Physical Substrate Determinations

(1) Substrate Elevation and Slope. Work on the embankment dams and dikes would be accomplished in an upland area. Construction of the temporary construction bridge could affect some riparian areas. Following construction these areas would be graded to pre-project conditions and the areas would be stabilized using hydroseeding methods after construction is complete.

(2) Sediment Type. The sediment type will be similar to that found in the project area now.

(3) Dredged/Fill Material Movement. Material used for foundation work and the temporary construction bridge would be compacted into place. Where feasible, the construction areas would be hydroseeded.

(4) Physical Effects on Benthos. No in-water work is anticipated under this alternative, therefore the benthic community would not be affected.

(5) Other Effects. Not Applicable.

(6) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible. Best management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

### b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water. Construction could result in short term increases of sediment loads near the work sites.

(2) Current Patterns and Circulation. Work under this alternative would be conducted on top of Folsom Dam and the embankment dam and dikes. Current patterns and circulation would not be affected by the work. Construction of the temporary construction bridge would not affect flows in the lower American River.

(3) Normal Water Level Fluctuations. None of the work would affect normal water level fluctuations.

(4) Salinity Gradients. Not applicable, the American River is a fresh water system.

(5) Actions That Will Be Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible. Best

management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Work under this alternative does not involve any in-water activities and should not result in an increase in turbidity levels.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - light penetration, dissolved oxygen, toxic metals and organics, pathogens, aesthetics, others as appropriate. The activities under this alternative would not substantially change the physical and chemical properties of the water column.

(3) Effects on Biota. See discussion under Aquatic Ecosystem and Organism Determinations below.

(4) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible. Best management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

d. Contaminant Determinations. There would be no contaminants introduced into the aquatic environment as a result of this work because all borrow material would be secured from a borrow source certified as being free from contaminants.

e. Aquatic Ecosystem and Organism Determination

(1-4) Effects on plankton, benthos, nekton, and the aquatic food web. The benthic community would not be affected, since no in-water work is anticipated.

(5) Effects on Special Aquatic Sites. The proposed action would not affect any special aquatic sites.

(6) Threatened and Endangered Species. Construction activities along the lower American River would adversely affect the valley elderberry longhorn beetle which may inhabit 21 elderberry shrubs in the footprint of the temporary construction bridge.

(7) Other Wildlife. Construction of this alternative would affect 4.6 acres of oak and pine-oak woodland and 1.3 acres of riparian woodland.

(8) Actions to Minimize Impacts. Potential effects to general wildlife and special status species in this area would be mitigated by developing 12.72 acres of oak and pine-oak woodland, and 1.3 acres of riparian woodland will be developed on project lands around Folsom Reservoir. Twenty-one elderberry shrubs would be removed under this

alternative. Compensation for these shrubs would be included in the oak woodland plantings.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. No work would be in any river currents.

(2) Determination of Compliance with Applicable Water Quality Standards. Water-quality management by the Central Valley Regional Water Quality Control Board includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. Beneficial uses of Folsom Reservoir includes municipal and industrial supply, irrigation, power, water contact and non-contact recreation, warm and cold freshwater habitat, warm freshwater spawning habitat, and wildlife habitat. The standards for these uses will not be violated since best management practices would be employed to limit turbidity and sediment transport.

(3) Potential Effects on Human Use Characteristics

*a. Municipal and Private Water Supply*. The work under this alternative would not affect any municipal or private water supply.

*b. Recreational and Commercial Fisheries.* Commercial and recreational fisheries would not be affected by the work under this alternative.

*c. Water Related Recreation*. Work under this alternative would not affect water related recreation

*d. Aesthetics.* The aesthetics of the local area would not be affected. Following construction the area would appear much as it does today.

*e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves*. None of these types of resources would be affected by this work.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The construction activities under this alternative would result less-than-significant adverse effects on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The proposed activities would not result in secondary impacts to the aquatic ecosystem in the region.

# American River Watershed, California
# Long-Term Study

# 404(b)(1) Water Quality Evaluation
# Seven-Foot Dam Raise/482-Foot Flood Pool Elevation
# Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

**AMERICAN RIVER WATERSHED, CALIFORNIA**
**LONG-TERM STUDY**

# 404(b)(1) WATER QUALITY EVALUATION
# SEVEN-FOOT DAM RAISE/482-FOOT FLOOD POOL ELEVATION
# TWELVE-FOOT DAM RAISE/487-FOOT FLOOD POOL ELEVATION

## I. PROJECT DESCRIPTION

### LOCATION

The project alternatives are located in the American river Basin and include Folsom Dam and Reservoir and the land areas immediately adjacent to the reservoir, Lake Natoma, the lower American River channel, the Sacramento and Yolo Bypasses and associated sloughs along the lower Sacramento River.

### GENERAL DESCRIPTION

For the purposes of this project, a variety of potential flood control measures were evaluated, and seven action alternatives were created for detailed evaluation along with the No-Action Alternative. The action alternatives being carried forward are: (1) 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, (2) Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, (3) Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation, (4) Stepped Release to 160,000 cfs, (5) Stepped Release to 160,000 cfs and New Outlet at Folsom Dam, (6) Stepped Release to 180,000 cfs, and (7) Stepped Release to 160,000 cfs and Seven-Foot Dam Raise. Both the Seven and Twelve-Foot Dam Raise Alternatives are presented in this evaluation since the direct construction impact between them is negligible. The general features are described below:

- Raise dam crest and construct a 3.5-foot parapet wall.
- Stabilize enlarged dam by a combination of constructing a concrete buttress on the downstream side of the spillway, and installing post-tension anchors in the dam. (This work would not be necessary under the Seven-Foot Dam Raise alternative.
- Replace all eight spillway gates.
- Extend and strengthen the existing spillway bridge piers.
- Replace the spillway bridge with one lane of traffic in each direction.
- Extend the stilling basin by 60 feet.
- Raise embankment dams and dikes.

- Modify the elevator tower.

- Enlarge L. L. Anderson Dam spillway.

- Construct a temporary construction bridge downstream of the dam. Following construction traffic would be routed back to the dam road at the discretion of the Bureau, and the temporary construction bridge would be removed.

- Borrow - take 150,000 cubic yards of borrow from the Peninsula site, and 1,350,000 cubic yards of material from the Mississippi Bar site. For the Seven-Foot Dam raise about 1/2 this amount of borrow would be needed.

- About 1/3 of a mile of Folsom Dam Road southeast of the left wing dam would be raised.

- Mooney Ridge - acquire flowage easements over 14-15 properties and acquire 1 property in fee title. Foundations of houses would be strengthened as necessary.

- Acquire flowage easements where the new high water mark would extend beyond project lands.

AUTHORITY AND PURPOSE

The basic authority for the overall study is the Flood Control Act of 1962 (Public Law [PL] 87-874), as follows:

> The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and flood aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multipurpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85-500.

Although this authorization applies to the overall study of the American River watershed, specific direction for the current effort is provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (PL 106-53):

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(a) FOLSOM FLOOD CONTROL STUDIES-

(1) IN GENERAL - The Secretary, in consultation with the State of California and local water resources agencies, shall undertake a study of increasing surcharge flood control storage at Folsom Dam and Reservoir.

(2) LIMITATIONS - The study of the Folsom Dam and Reservoir undertaken under paragraph (1) shall assume that there is to be no increase in conservation storage at the Folsom Reservoir.
(3) REPORT - Not later than March 1, 200, the Secretary shall transmit to Congress a report on the results of the study under this subsection.

(b) AMERICAN AND SACRAMENTO RIVERS FLOOD CONTROL STUDY -
(1) IN GENERAL - The Secretary shall undertake a study of all levees on the American River and on the Sacramento River downstream and immediately upstream of the confluence of such Rivers to assess opportunities to increase potential flood protection through levee modification.
(2) DEADLINE FOR COMPLETION - Not later than March 1, 2000, the Secretary shall transmit to Congress a report on the results of the study undertaken under this subsection.

Flood control alternatives considered in this study focus on increasing Folsom Dam flood control storage, modifying lower American River and downstream levees, and a combination of modifying lower American River and downstream levees and increasing Folsom Dam storage.

GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

Construction of this alternative would be accomplished primarily in upland areas. About 750,000 cubic yards of borrow material would be needed for the Seven-Foot Raise and 1,500,000 cubic yards of borrow material would be needed for the Twelve-Foot Raise. This material would be used for enlarging the embankment dams and dikes and constructing the temporary construction bridge would be placed. Fill material would be excavated from the reservoir at the Peninsula site, and also from Mississippi Bar.

Borrow material from Mississippi Bar would be excavated and transported across Lake Natomas by barge and then hauled by truck up to Folsom Dam. Some dredging or a pier may need to be installed in order to provide barge access at both the loading area and the offloading area at Willow Creek Recreation Area.

DESCRIPTION OF PROPOSED DISCHARGE SITE(S)

(1) Location. The proposed discharge sites are located in the immediate vicinity of Folsom Dam.

(2) Size. The construction area consists of the tops of the dam as well as the embankment dams and dikes, and a temporary construction bridge about 1 mile long.

(3) Type of Site. All of the work proposed under this alternative would occur in an area that has been developed as flood control facility for at least 40 years.

(4) Type(s) of Habitat. This work will be accomplished in a variety of cover types, primarily upland, but also areas of riparian woodland and oak woodland.

(5) Timing and Duration of Discharge. Construction of these alternatives would be completed in about 6 years. Construction could occur year round.

DESCRIPTION OF DISPOSAL METHOD

Concrete to construct the piers and parapet walls would be trucked on to site using local suppliers from the Bradshaw/Kiefer area. Fill material needed for foundation work would be excavated from both the Peninsula and Mississippi Bar borrow sites. Borrow material would hauled to the work sites around the reservoir and to the temporary construction bridge site. This material would be compacted into place at the work site.

## II. FACTUAL DETERMINATIONS

### a. Physical Substrate Determinations

(1) Substrate Elevation and Slope. Work on the embankment dams and dikes would be accomplished in an upland area. Construction of the temporary construction bridge could affect some riparian areas. Following construction these areas would be graded to pre-project conditions and the areas would be stabilized using hydroseeding methods after construction is complete.

(2) Sediment Type. The sediment type will be similar to that found in the project area now.

(3) Dredged/Fill Material Movement. Material used for foundation work and the temporary construction bridge would be compacted into place. Where feasible, the construction areas would be hydroseeded.

(4) Physical Effects on Benthos. No in-water work is anticipated under this alternative, therefore the benthic community would not be affected.

(5) Other Effects. Not Applicable.

(6) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible. Best management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

### b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water. Construction could result in short term increases of sediment loads near the work sites.

(2) Current Patterns and Circulation. Work under this alternative would be conducted on top of Folsom Dam and the embankment dam and dikes. Current patterns

and circulation would not be affected by the work. Construction of the temporary construction bridge would not affect flows in the lower American River.

(3) Normal Water Level Fluctuations. None of the work would affect normal water level fluctuations.

(4) Salinity Gradients. Not applicable, the American River is a fresh water system.

(5) Actions That Will Be Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible. Best management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Work under this alternative does not involve any in-water activities and should not result in an increase in turbidity levels.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - light penetration, dissolved oxygen, toxic metals and organics, pathogens, aesthetics, others as appropriate. The activities under this alternative would not substantially change the physical and chemical properties of the water column.

(3) Effects on Biota. See discussion under Aquatic Ecosystem and Organism Determinations below.

(4) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible. Best management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

d. Contaminant Determinations. There would be no contaminants introduced into the aquatic environment as a result of this work because all borrow material would be secured from a borrow source certified as being free from contaminants.

e. Aquatic Ecosystem and Organism Determination

(1-4) Effects on plankton, benthos, nekton, and the aquatic food web. The benthic community would not be affected, since no in-water work is anticipated.

(5) Effects on Special Aquatic Sites. The proposed action would not affect any special aquatic sites.

(6) Threatened and Endangered Species. Construction activities at Folsom Reservoir would adversely affect the valley elderberry longhorn beetle which may inhabit 40 elderberry shrubs in the construction footprint.

(7) Other Wildlife. Construction of this alternative would affect 29.8 acres of oak and pine-oak woodland, 10.3 acres of riparian woodland, and 0.3 acres of seasonal wetland.

(8) Actions to Minimize Impacts. Mitigation for these losses would consist of planting 10.3 acres of riparian woodland and 0.3 acres of seasonal wetland at the Bureau's Mormon Island Wetland Preserve, and planting 79 acres of oak and pine-oak woodland on project land around Folsom Reservoir. A total of 40 elderberry shrubs would be directly impacted from construction. Compensation for these shrubs would be included in the oak woodland plantings around the reservoir.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. No work would be in any river currents.

(2) Determination of Compliance with Applicable Water Quality Standards. Water-quality management by the Central Valley Regional Water Quality Control Board includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. Beneficial uses of Folsom Reservoir includes municipal and industrial supply, irrigation, power, water contact and non-contact recreation, warm and cold freshwater habitat, warm freshwater spawning habitat, and wildlife habitat. The standards for these uses will not be violated since best management practices would be employed to limit turbidity and sediment transport.

(3) Potential Effects on Human Use Characteristics

*a. Municipal and Private Water Supply*. The work under this alternative would not affect any municipal or private water supply.

*b. Recreational and Commercial Fisheries.* Commercial and recreational fisheries would not be affected by the work under this alternative.

*c. Water Related Recreation*. Work under this alternative would not affect water related recreation

*d. Aesthetics.* The aesthetics of the local area would not be affected. Following construction the area would appear much as it does today.

*e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves*. None of these types of resources would be affected by this work.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The construction activities under this alternative would result less-than-significant adverse effects on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The proposed activities would not result in secondary impacts to the aquatic ecosystem in the region.

# American River Watershed, California
# Long-Term Study

# 404(b)(1) Water Quality Evaluation
# Stepped Release to 160,000 cfs

**AMERICAN RIVER WATERSHED, CALIFORNIA**
**LONG-TERM STUDY**

# 404(b)(1) WATER QUALITY EVALUATION
# STEPPED RELEASE TO 160,000 CFS

## I. PROJECT DESCRIPTION

### LOCATION

The project alternatives are located in the American river Basin and include Folsom Dam and Reservoir and the land areas immediately adjacent to the reservoir, Lake Natoma, the lower American River channel, the Sacramento and Yolo Bypasses and associated sloughs along the lower Sacramento River.

### GENERAL DESCRIPTION

For the purposes of this project, a variety of potential flood control measures were evaluated, and seven action alternatives were created for detailed evaluation along with the No-Action Alternative. The action alternatives being carried forward are: (1) 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, (2) Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, (3) Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation, (4) Stepped Release to 160,000 cfs, (5) Stepped Release to 160,000 cfs and New Outlet at Folsom Dam, (6) Stepped Release to 180,000 cfs, and (7) Stepped Release to 160,000 cfs and Seven-Foot Dam Raise. The Stepped Release to 160,000 cfs is presented here.

### STEPPED RELEASE TO 160,000 CFS

- Construct a 7-foot high stability berm and lengthen the levee slope from the Sacramento River to the Natomas East Main Drainage Canal. Reshape about 400 feet of the landside levee slope in this reach.

- Erosion protection placed along 5.8 miles of levee slopes so they can withstand the higher flow velocities.

- Modify interior drainages.

- Construct hydraulic mitigation features as described below.

**<u>Hydraulic Mitigation</u>**

- Work along the right bank of the Yolo Bypass will be slurry wall construction. No additional fill material will be needed for this work. A temporary construction easement would be acquired from the levee toe 100 feet to the landside. Work within this easement will include all staging and slurry batch mixing activities. Table 1 shows the location of

slurry wall work. The irrigation drainage ditch that is located landside of the levee would be protected in place by placing pre-cast double T's across the ditch. For impact analysis purposes we assumed a worst case scenario where 1/2 of the linear length of the ditch would be encased with the pre-cast double T's. Construction of the slurry wall could be completed in 2 years.

**Table 1**

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 49.4 | 60 | 6,000 |
| 47.2 | 60 | 6,000 |
| 44.9 | 40 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from levee crest

- Work in Index Area 3 will consist of both slurry wall work (Table 2), and a combination of seepage/stability berms (Tables 3 and 4). Slurry wall work in this area would proceed as described above.

**Table 2**

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 23.3 | 60 | 6,000 |
| 22.1 | 70 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from crest

For alternative B, the impact assessment is based on a total of 80-feet from the levee toe (60-foot permanent easement and a 20-foot temporary construction easement).

For alternative C, the impact assessment is based on a total of 55-feet from the levee toe (35-foot permanent easement and 20 foot temporary construction easement).

For alternative C-1, the impact assessment is based on a 35-foot permanent impact for the drainage collector system. The area between the levee toe and the existing drainage ditch would be used for staging.

For alternative D, the impact assessment is based on a total of 45-feet from the levee toe (25-foot permanent easement and 20-foot temporary easement).

A distance of 15-feet from the levee crown to the levee toe is the potential impact area on all levees to be modified.

To construct the sites identified in tables 3 and 4, a total of 154,000 cubic yards of earth fill are needed. This borrow material will be obtained from the Grand Island dredge disposal area. Access between Grand Island and the individual sites will be on the existing levee roads. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

In areas where the landside work would extend into a nearby ditch construction would proceed by placing drain rock into the ditch to form a working surface, and then building up with soil to create the berm.

Eight staging areas have been identified. These sites would be 300-feet by 500-feet in size. All of the staging areas are on agricultural land, seven are located in row crops and one is on orchard.

Construction of sites in Index Area 3 would take approximately 2 years.

**Table 3**

| River or Slough | Site # | LM/ Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Steamboat | 501-00-1 | 1.62/ Right | Boils | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Sutter | 349-00-1 | 2.39/ Left | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. C - 25' Wide x 600' Long) & (Alt. C1 - 25' Wide x 730' Long) |
| Steamboat | 3-00-1 | 3.1/ Left | Slumping | Seepage/Stability Berm (Alt. D - 12' Wide x 1,500' Long) |
| Sacramento | 3-00-6 | 8.09- 8.15/ Right | Boils | Seepage/Stability Berm (Alt. D - 12' Wide x 1,000' Long) |

**Table 4**

| River or Slough | Site # | 1993 Report Figure/Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Sutter | 349-1 | Fig 4 / Left | Boils | Stability Berm (Alt. C - 25' Wide x 1,500' Long) |
| Steamboat | 501-8 | Fig 4 / Right | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. B - 45' Wide x 2,000' Long) |
| Steamboat | 501-9 | Fig 4 / Right | Slumping | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Steamboat | 3-2 | Fig 4 / Left | Stability | Stability Berm (Alt. D - 12' Wide x 8,000' Long) |
| Steamboat | 3-3 | Fig 4 / Left | Seepage | Seepage Berm (Alt. C – 25' Wide x 300' Long) |
| Cache | 501-1A | Fig 4 / Left | Stability/ Seepage | Stability/Seepage Berm (Alt. B – 45' Wide x 1,200' Long) |
| Cache | 2098-10 | Fig 4 / Left | Stability | Stability Berm (Alt D – 12' Wide x 2,500' Long) |
| Cache | 2098-10A | Fig 4 / Left | Stability/ Seepage | Stability/Seepage Berm (Alt C-1 – 25' Wide x 400' Long) |
| Yolo Bypass | 2068-1 | Fig 3 / Right | Stability | Stability Bern (Alt D – 12' Wide x 2,500' Long) |
| Yolo Bypass | 2068-2 | Fig 3 / Right | Stability | Stability Berm (Alt D – 12' Wide x 10,000' Long) |

- The fix for work along the left levee of the Yolo Bypass will consist of lime treatment. The length of levee improvements extends about 6 miles along the left bank of the Yolo Bypass from I-5 downstream to the north levee of the Sacramento Bypass. Construction will consist of stripping and stockpiling the topsoil on the levee crown and landside levee

slope. About 4 feet of levee material would then be excavated and mixed with lime. A wet lime would be used to reduce the dust. The levee would be reconstructed using the soil/lime mixture. The stockpiled topsoil would then be placed back on the levee crown and landside slope. In addition, the existing ditch would be relocated a maximum of about 140 feet from the existing toe. The total impact area would extend 150 feet from the levee toe. This will allow 140 feet for staging and ditch relocation and 10-feet for a temporary construction easement on the other side of the ditch. Construction of Index Area 1L will take about 2 years.

- Relocation of the north levee of the Sacramento Bypass. The Sacramento Weir would be lengthened 1,000 feet and the bypass would be widened an equal amount. This widening was sized to accommodate an objective release of 145,000 cfs. About 1/3 of the existing north levee would be used to construct the new levee 1,000 feet to the north (about 7.8 acres of borrow material). The rest of the existing north levee would be graded and seeded to provide mounds for wildlife habitat. The remainder of the fill material needed for levee construction would be obtained from the Port of Sacramento.

  The new weir would have the same configuration and section as the existing weir. The new weir would consist of 25 forty-foot-wide bays and will be located to the north of the existing weir along the alignment of the railroad line. A temporary railroad line and road would be constructed that bypass the weir construction. The temporary railroad alignment uses 750-foot radii with transition segments. The speed of the train would be about 15 mph on the temporary bypass. The Sacramento River Road would be connected along a new alignment to the existing road after passing over the new weir. Upon completion of construction of the new weir, the temporary railroad and road bypass would be removed. A total of 5.15 acres of oak woodland would be lost from relocation and construction of the new levee.

  In addition, there is an old landfill that would have to be removed when the bypass is widened. The landfill occupies about 20 acres of land and averages about 5 feet in depth. Two agricultural pumping plants and a gaging station would be relocated, along with four buildings. The cover type at this landfill is upland herbaceous.

AUTHORITY AND PURPOSE

The basic authority for the overall study is the Flood Control Act of 1962 (Public Law [PL] 87-874), as follows:

> The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and flood aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multipurpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85-500.

Although this authorization applies to the overall study of the American River watershed, specific direction for the current effort is provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (PL 106-53):

**SEC. 566. FOLSOM DAM AND RESERVOIR ADDITIONAL STORAGE AND ADDITIONAL FLOOD CONTROL STUDIES**

(a) FOLSOM FLOOD CONTROL STUDIES-

(1) IN GENERAL - The Secretary, in consultation with the State of California and local water resources agencies, shall undertake a study of increasing surcharge flood control storage at Folsom Dam and Reservoir.

(2) LIMITATIONS - The study of the Folsom Dam and Reservoir undertaken under paragraph (1) shall assume that there is to be no increase in conservation storage at the Folsom Reservoir.

(3) REPORT - Not later than March 1, 200, the Secretary shall transmit to Congress a report on the results of the study under this subsection.

(b) AMERICAN AND SACRAMENTO RIVERS FLOOD CONTROL STUDY -

(1) IN GENERAL - The Secretary shall undertake a study of all levees on the American River and on the Sacramento River downstream and immediately upstream of the confluence of such Rivers to assess opportunities to increase potential flood protection through levee modification.

(2) DEADLINE FOR COMPLETION - Not later than March 1, 2000, the Secretary shall transmit to Congress a report on the results of the study undertaken under this subsection.

Flood control alternatives considered in this study focus on increasing Folsom Dam flood control storage, modifying lower American River and downstream levees, and a combination of modifying lower American River and downstream levees and increasing Folsom Dam storage.

GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

Levee modifications along the lower American River and in the hydraulic mitigation areas would be accomplished using material similar to that which was used to construct the existing levees. Several borrow sites have been identified as the source of fill material. Two sites, 52 acres and 72 acres, are located adjacent to each other near Lake Washington in West Sacramento. These are the primary borrow sites for levee work on the lower American River, and for constructing the new north levee of the Sacramento River. An additional borrow site is located between Bradshaw Road and Happy Lane. This site is approximately 64 acres. Fill material needed to construct the hydraulic mitigation sites will be obtained from the Grand Island dredge disposal area. A total of 154,000 cubic yards of material for the hydraulic mitigation work is needed. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

DESCRIPTION OF PROPOSED DISCHARGE SITE(S)

(1) Location. The proposed discharge sites are located along the lower American River,

north of the Sacramento Bypass, and along levees of the Yolo Bypass and associated sloughs.

(2) Size. Levee modification along the lower American River is about 1 mile in length. The work would take place on the landside of the levee. Hydraulic mitigation work consists of about 19 miles of work as described in the tables above.

(3) Type of Site. All of the work along the lower American River and along the Yolo Bypass would occur in areas that have been developed as flood control levees for at least 40 years.

(4) Type(s) of Habitat. This work will be accomplished in a variety of cover types including riparian, oak woodland, freshwater emergent marsh, open water, rice, and grassland.

(5) Timing and Duration of Discharge. Work along the lower American River and the hydraulic mitigation sites would be constructed during the spring and summer dry season, typically from May through October. It is estimated that work on the lower American River could be completed in 2 years, while the hydraulic mitigation would take 6 years to complete.

DESCRIPTION OF DISPOSAL METHOD

Levee modifications would generally entail removing topsoil and organic material, and placing the fill material to create a berm or modify the levee slope. For the hydraulic mitigation areas drainage ditches would be relocated and some in-water work would be needed to construct stability berms. Where slurry wall work encroaches on drainage ditches along the Yolo Bypass, precast double T's would be used to protect the ditch in place and provide a working platform. In areas where in-water work is needed the following precautions would be taken:

- Coffer dams will be used for in-water construction. Water will be removed and routed to either 1) sedimentation pond located on a flat stable area that will prevent silt-laden water from reentering the river, ditch, or reservoir.

- A qualified biologist will examine the coffer dam prior to dewatering. If determined to be appropriate by the biologist, a fish salvage program will be conducted prior to complete dewatering. The rescued fish will be released downstream of the construction site.

- Construction areas in the Sacramento and Yolo Bypasses will be graded to slope back into the bypass drainage system to provide passage and escape for fish.

## II. FACTUAL DETERMINATIONS

a. <u>Physical Substrate Determinations</u>

(1) Substrate Elevation and Slope. Work along the lower American River would be accomplished in an upland area. Construction of the hydraulic mitigation could affect

some wetland areas. Following construction these areas would be graded to pre-project conditions and the areas would be stabilized using hydroseeding methods after construction is complete.

(2) Sediment Type. The sediment type will be similar to that found in the project area now.

(3) Dredged/Fill Material Movement. Material used to reconstruct levees would be compacted in place. These areas would be stabilized using hydroseeding methods after construction is complete and would not erode into any drainage or irrigation ditches nearby.

(4) Physical Effects on Benthos. The benthic community in the immediate area of drainage ditch relocation would be removed. This community is probably fairly simple and does not support an extensive or complex aquatic community. The benthic community would reestablish itself following construction of the new drainage ditch.

(5) Other Effects. Not Applicable.

(6) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method".

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water. Construction along the lower American River, and along the Yolo Bypass and sloughs could result in short term increases of sediment loads in drainage or irrigation canals near the work sites.

(2) Current Patterns and Circulation. Where drainage ditches need to be relocated, the new ditch would be constructed prior to filling the existing ditch. Current patterns and circulation would not be affected by the work.

(3) Normal Water Level Fluctuations. None of the work would affect normal water level fluctuations.

(4) Salinity Gradients. Not applicable, the American River is a fresh water system.

(5) Actions That Will Be Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water

work is necessary coffer dams will be used as described under “Description of Disposal Method”.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Short-term increases in turbidity may be seen where in-water work is needed to construct stability berms along the Yolo Bypass.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - light penetration, dissolved oxygen, toxic metals and organics, pathogens, aesthetics, others as appropriate. The activities under this alternative would not substantially change the physical and chemical properties of the water column.

(3) Effects on Biota. See discussion under Aquatic Ecosystem and Organism Determinations below.

(4) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under “Description of Disposal Method”.

d. Contaminant Determinations. There would be no contaminants introduced into the aquatic environment as a result of the levee stabilization work because all borrow material would be secured from a borrow source certified as being free from contaminants.

e. Aquatic Ecosystem and Organism Determination

(1-4) Effects on plankton, benthos, nekton, and the aquatic food web. The benthic community existing in the drainage ditches would be temporarily disturbed by relocation. Following ditch relocation, the benthic community would reestablish.

(5) Effects on Special Aquatic Sites. The proposed action would not affect any special aquatic sites. There are no special aquatic sites at the sediment removal site.

(6) Threatened and Endangered Species. Construction activities along the lower American River would adversely affect the valley elderberry longhorn beetle which may inhabit 3 elderberry shrubs in the project footprint. Work to construction the hydraulic mitigation could adversely affect the giant garter snake, delta smelt, and Sacramento splittail. The State-listed Swainson’s hawk may also be found in this area.

(7) Other Wildlife. Construction of this alternative would affect 6.3 acres of riparian woodland and 1.5 acres of oak woodland. Construction of the hydraulic mitigation would affect 16.4 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields.

(8) Actions to Minimize Impacts. Potential effects to general wildlife and special status species along the lower American River would be mitigated by developing 6 acres of riparian woodland at an appropriate site such as Mississippi Bar, and 5.4 acres of oak woodland at Rossmoor Bar. Mitigation for the 3 elderberry shrubs would be included in the riparian and oak woodland plantings.

Construction of the hydraulic mitigation features would result in the loss of 16.6 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields. Construction of the hydraulic mitigation features could adversely affect the Federally listed giant garter snake, delta smelt, and Sacramento splittail as well as the State listed Swainson's hawk. Mitigation would consist of creating 18 acres of riparian woodland, and 17.7 acres of oak woodland on Egbert Tract. To mitigate for adverse effects to Federally listed species, a total of 141 acres of wetlands would be developed at Egbert Tract. Mitigation for the State listed Swainson's hawk would consist of a buffer of up to 1/2 mile around any active nest site.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. The proposed work would be done in an area that is isolated from river currents.

(2) Determination of Compliance with Applicable Water Quality Standards. Water-quality management by the Central Valley Regional Water Quality Control Board includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. Beneficial uses of the lower American River includes municipal and industrial supply, irrigation, power, water contact and non-contact recreation, warm and cold freshwater habitat, warm freshwater spawning habitat, and wildlife habitat. The standards for these uses will not be violated since best management practices would be employed to limit turbidity and sediment transport.

(3) Potential Effects on Human Use Characteristics

*a. Municipal and Private Water Supply*. The work under this alternative would not affect any municipal or private water supply. New irrigation ditches would be constructed prior to filling the existing ditches.

*b. Recreational and Commercial Fisheries.* Commercial and recreational fisheries would not be affected by the work under this alternative.

*c. Water Related Recreation*. Work under this alternative would not affect water related recreation.

*d. Aesthetics.* The aesthetics of the local area would not be affected. Following construction the area would appear much as it does today.

*e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves.* None of these types of resources would be affected by this work.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The construction activities under this alternative would result less-than-significant adverse effects on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The proposed activities would not result in secondary impacts to the aquatic ecosystem in the region.

# American River Watershed, California
# Long-Term Study

# 404(b)(1) Water Quality Evaluation
# Stepped Release to 160,000 cfs and
# New Outlet at Folsom Dam

**AMERICAN RIVER WATERSHED, CALIFORNIA**
**LONG-TERM STUDY**

# 404(b)(1) WATER QUALITY EVALUATION STEPPED RELEASE TO 160,000 CFS AND NEW OUTLET AT FOLSOM DAM

## I. PROJECT DESCRIPTION

### LOCATION

The project alternatives are located in the American River Basin and include Folsom Dam and Reservoir and the land areas immediately adjacent to the reservoir, Lake Natoma, the lower American River channel, the Sacramento and Yolo Bypasses and associated sloughs along the lower Sacramento River.

### GENERAL DESCRIPTION

For the purposes of this project, a variety of potential flood control measures were evaluated, and seven action alternatives were created for detailed evaluation along with the No-Action Alternative. The action alternatives being carried forward are: (1) 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, (2) Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, (3) Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation, (4) Stepped Release to 160,000 cfs, (5) Stepped Release to 160,000 cfs and New Outlet at Folsom Dam, (6) Stepped Release to 180,000 cfs, and (7) Stepped Release to 160,000 cfs and Seven-Foot Dam Raise. The Stepped Release to 160,000 cfs and construction of a new outlet at Folsom Dam is presented here.

### STEPPED RELEASE TO 160,000 CFS AND NEW OUTLET AT FOLSOM DAM

- Construct a 6-foot by 12-foot gated conduit through Folsom Dam, exiting on the auxiliary spillway face and discharging into the spillway stilling basin. Capacity of the new outlet would be 30,000 cfs at gross pool.

- Construct a 7-foot high stability berm and lengthen the levee slope from the Sacramento River to the Natomas East Main Drainage Canal. Reshape about 400 feet of the landside levee slope in this reach.

- Erosion protection placed along 5.8 miles of levee slopes so they can withstand the higher flow velocities.

- Modify interior drainages.

- Construct hydraulic mitigation features as described below.

**Hydraulic Mitigation**

- Work along the right bank of the Yolo Bypass will be slurry wall construction. No additional fill material will be needed for this work. A temporary construction easement would be acquired from the levee toe 100 feet to the landside. Work within this easement will include all staging and slurry batch mixing activities. Table 1 shows the location of slurry wall work. The irrigation drainage ditch that is located landside of the levee would be protected in place by placing pre-cast double T's across the ditch. For impact analysis purposes we assumed a worst case scenario where 1/2 of the linear length of the ditch would be encased with the pre-cast double T's. Construction of the slurry wall could be completed in 2 years.

Table 1

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 49.4 | 60 | 6,000 |
| 47.2 | 60 | 6,000 |
| 44.9 | 40 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from levee crest

- Work in Index Area 3 will consist of both slurry wall work (Table 2), and a combination of seepage/stability berms (Tables 3 and 4). Slurry wall work in this area would proceed as described above.

Table 2

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 23.3 | 60 | 6,000 |
| 22.1 | 70 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from crest

For alternative B, the impact assessment is based on a total of 80-feet from the levee toe (60-foot permanent easement and a 20-foot temporary construction easement).

For alternative C, the impact assessment is based on a total of 55-feet from the levee toe (35-foot permanent easement and 20 foot temporary construction easement).

For alternative C-1, the impact assessment is based on a 35-foot permanent impact for the drainage collector system. The area between the levee toe and the existing drainage ditch would be used for staging.

For alternative D, the impact assessment is based on a total of 45-feet from the levee toe (25-foot permanent easement and 20-foot temporary easement).

A distance of 15-feet from the levee crown to the levee toe is the potential impact area on all levees to be modified.

To construct the sites identified in tables 3 and 4, a total of 154,000 cubic yards of earth fill are needed. This borrow material will be obtained from the Grand Island dredge disposal area. Access between Grand Island and the individual sites will be on the existing levee roads. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

In areas where the landside work would extend into a nearby ditch construction would proceed by placing drain rock into the ditch to form a working surface, and then building up with soil to create the berm.

Eight staging areas have been identified. These sites would be 300-feet by 500-feet in size. All of the staging areas are on agricultural land, seven are located in row crops and one is on orchard.

Construction of sites in Index Area 3 would take approximately 2 years.

**Table 3**

| River or Slough | Site # | LM/ Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Steamboat | 501-00-1 | 1.62/ Right | Boils | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Sutter | 349-00-1 | 2.39/ Left | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. C - 25' Wide x 600' Long) & (Alt. C1 - 25' Wide x 730' Long) |
| Steamboat | 3-00-1 | 3.1/ Left | Slumping | Seepage/Stability Berm (Alt. D - 12' Wide x 1,500' Long) |
| Sacramento | 3-00-6 | 8.09- 8.15/ Right | Boils | Seepage/Stability Berm (Alt. D - 12' Wide x 1,000' Long) |

**Table 4**

| River or Slough | Site # | 1993 Report Figure/Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Sutter | 349-1 | Fig 4 / Left | Boils | Stability Berm (Alt. C - 25' Wide x 1,500' Long) |
| Steamboat | 501-8 | Fig 4 / Right | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. B - 45' Wide x 2,000' Long) |
| Steamboat | 501-9 | Fig 4 / Right | Slumping | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Steamboat | 3-2 | Fig 4 / Left | Stability | Stability Berm (Alt. D - 12' Wide x 8,000' Long) |
| Steamboat | 3-3 | Fig 4 / Left | Seepage | Seepage Berm (Alt. C – 25' Wide x 300' Long) |
| Cache | 501-1A | Fig 4 / Left | Seepage/ Stability | Stability/Seepage Berm (Alt. B – 45' Wide x 1,200' Long) |
| Cache | 2098-10 | Fig 4 / Left | Stability | Stability Berm (Alt D – 12' Wide x 2,500' Long) |
| Cache | 2098-10A | Fig 4 / Left | Seepage/ Stability | Seepage/Stability Berm (Alt C-1 – 25' Wide x 400' Long) |
| Yolo Bypass | 2068-1 | Fig 3 / Right | Stability | Stability Bern (Alt D – 12' Wide x 2,500' Long) |
| Yolo Bypass | 2068-2 | Fig 3 / Right | Stability | Stability Berm (Alt D – 12' Wide x 10,000' Long) |

- The fix for work along the left levee of the Yolo Bypass will consist of lime treatment. The length of levee improvements extends about 6 miles along the left bank of the Yolo Bypass from I-5 downstream to the north levee of the Sacramento Bypass. Construction will consist of stripping and stockpiling the topsoil on the levee crown and landside levee slope. About 4 feet of levee material would then be excavated and mixed with lime. A wet lime would be used to reduce the dust. The levee would be reconstructed using the soil/lime mixture. The stockpiled topsoil would then be placed back on the levee crown and landside slope. In addition, the existing ditch would be relocated a maximum of about 140 feet from the existing toe. The total impact area would extend 150 feet from the levee toe. This will allow 140 feet for staging and ditch relocation and 10-feet for a temporary construction easement on the other side of the ditch. Construction of Index Area 1L will take about 2 years.

- Relocation of the north levee of the Sacramento Bypass. The Sacramento Weir would be lengthened 1,000 feet and the bypass would be widened an equal amount. This widening was sized to accommodate an objective release of 145,000 cfs. About 1/3 of the existing north levee would be used to construct the new levee 1,000 feet to the north (about 7.8 acres of borrow material). The rest of the existing north levee would be graded and seeded to provide mounds for wildlife habitat. The remainder of the fill material needed for levee construction would be obtained from the Port of Sacramento.

  The new weir would have the same configuration and section as the existing weir. The new weir would consist of 25 forty-foot-wide bays and will be located to the north of the existing weir along the alignment of the railroad line. A temporary railroad line and road would be constructed that bypass the weir construction. The temporary railroad alignment uses 750-foot radii with transition segments. The speed of the train would be about 15 mph on the temporary bypass. The Sacramento River Road would be connected along a new alignment to the existing road after passing over the new weir. Upon completion of construction of the new weir, the temporary railroad and road bypass would be removed. A total of 5.15 acres of oak woodland would be lost from relocation and construction of the new levee.

  In addition, there is an old landfill that would have to be removed when the bypass is widened. The landfill occupies about 20 acres of land and averages about 5 feet in depth. Two agricultural pumping plants and a gaging station would be relocated, along with four buildings. The cover type at this landfill is upland herbaceous.

AUTHORITY AND PURPOSE

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> The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and flood aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions,

which include the following named localities: Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multipurpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85-500.

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(b) AMERICAN AND SACRAMENTO RIVERS FLOOD CONTROL STUDY -

(1) IN GENERAL - The Secretary shall undertake a study of all levees on the American River and on the Sacramento River downstream and immediately upstream of the confluence of such Rivers to assess opportunities to increase potential flood protection through levee modification.

(2) DEADLINE FOR COMPLETION - Not later than March 1, 2000, the Secretary shall transmit to Congress a report on the results of the study undertaken under this subsection.

Flood control alternatives considered in this study focus on increasing Folsom Dam flood control storage, modifying lower American River and downstream levees, and a combination of modifying lower American River and downstream levees and increasing Folsom Dam storage.

GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

Levee modifications along the lower American River and in the hydraulic mitigation areas would be accomplished using material similar to that which was used to construct the existing levees. Several borrow sites have been identified as the source of fill material. Two sites, 52 acres and 72 acres, are located adjacent to each other near Lake Washington in West Sacramento. These are the primary borrow sites for levee work on the lower American River, and for constructing the new north levee of the Sacramento River. An additional borrow site is located between Bradshaw Road and Happy Lane. This site is approximately 64 acres. Fill material needed to construct the hydraulic mitigation sites will be obtained from the Grand Island dredge disposal area. A total of 154,000 cubic yards of material for the hydraulic mitigation work is needed. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

Construction of the new outlet would take place is a confined area at Folsom Dam. This construction would be limited primarily to the interior of Folsom Dam as a new outlet is excavated. No fill material would be needed for this portion of the alternative.

DESCRIPTION OF PROPOSED DISCHARGE SITE(S)

(1) Location. The proposed discharge sites are located along the lower American River, north of the Sacramento Bypass, and along levees of the Yolo Bypass and associated sloughs. No fill material would be needed to construct a new outlet at Folsom Dam.

(2) Size. Levee modification along the lower American River is about 1 mile in length. The work would take place on the landside of the levee. Hydraulic mitigation work consists of about 19 miles of work as described in the tables above.

(3) Type of Site. All of the work along the lower American River and along the Yolo Bypass would occur in areas that have been developed as flood control levees for at least 40 years.

(4) Type(s) of Habitat. This work will be accomplished in a variety of cover types including riparian, oak woodland, freshwater emergent marsh, open water, rice, and grassland.

(5) Timing and Duration of Discharge. Work along the lower American River and the hydraulic mitigation sites would be constructed during the spring and summer dry season, typically from May through October. It is estimated that work on the lower American River could be completed in 2 years, while the hydraulic mitigation would take 6 years to complete.

DESCRIPTION OF DISPOSAL METHOD

Levee modifications would generally entail removing topsoil and organic material, and placing the fill material to create a berm or modify the levee slope. For the hydraulic mitigation areas drainage ditches would be relocated and some in-water work would be needed to construct stability berms. Where slurry wall work encroaches on drainage ditches along the Yolo Bypass, precast double T's would be used to protect the ditch in place and provide a working platform. In areas where in-water work is needed the following precautions would be taken:

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(2) Sediment Type. The sediment type will be similar to that found in the project area now.

(3) Dredged/Fill Material Movement. Material used to reconstruct levees would be compacted in place. These areas would be stabilized using hydroseeding methods after construction is complete and would not erode into any drainage or irrigation ditches nearby.

(4) Physical Effects on Benthos. The benthic community in the immediate area of drainage ditch relocation would be removed. This community is probably fairly simple and does not support an extensive or complex aquatic community. The benthic community would reestablish itself following construction of the new drainage ditch.

(5) Other Effects. Not Applicable.

(6) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method".

Work to construct a new outlet at Folsom Dam would also be restricted to the smallest possible area. A watertight bulkhead would be placed on the upstream face of the dam so that excavation of the new outlet could be done in the dry. Best management practices would be implemented to minimize potential effects to downstream waters.

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water. Construction along the lower American River, and along the Yolo Bypass and sloughs could result in short term increases of sediment loads in drainage or irrigation canals near the work sites. A bulkhead gate would be placed on the upstream face of the dam prior to construction of a new outlet at Folsom Dam would

(2) Current Patterns and Circulation. Where drainage ditches need to be relocated, the new ditch would be constructed prior to filling the existing ditch. Current

patterns and circulation would not be affected by the work along the Yolo Bypass or at Folsom Dam. The existing outlets would be available for releases as needed.

(3) Normal Water Level Fluctuations. None of the work would affect normal water level fluctuations.

(4) Salinity Gradients. Not applicable, the American River is a fresh water system.

(5) Actions That Will Be Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method".

Work to construct a new outlet at Folsom Dam would also be restricted to the smallest possible area. A watertight bulkhead would be placed on the upstream face of the dam so that excavation of the new outlet could be done in the dry. Best management practices would be implemented to minimize potential effects to downstream area.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Short-term increases in turbidity may be seen where in-water work is needed to construct stability berms along the Yolo Bypass and to construct the new outlet at Folsom Dam.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - light penetration, dissolved oxygen, toxic metals and organics, pathogens, aesthetics, others as appropriate. The activities under this alternative would not substantially change the physical and chemical properties of the water column.

(3) Effects on Biota. See discussion under Aquatic Ecosystem and Organism Determinations below.

(4) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under “Description of Disposal Method”.

Work to construct a new outlet at Folsom Dam would also be restricted to the smallest possible area. A watertight bulkhead would be placed on the upstream face of the dam so that excavation of the new outlet could be done in the dry. Best management practices would be implemented to minimize potential effects to downstream area.

d. Contaminant Determinations. There would be no contaminants introduced into the aquatic environment as a result of the levee stabilization work because all borrow material would be secured from a borrow source certified as being free from contaminants.

e. Aquatic Ecosystem and Organism Determination

(1-4) Effects on plankton, benthos, nekton, and the aquatic food web. The benthic community existing in the drainage ditches would be temporarily disturbed by relocation. Following ditch relocation, the benthic community would reestablish.

(5) Effects on Special Aquatic Sites. The proposed action would not affect any special aquatic sites. There are no special aquatic sites at the sediment removal site.

(6) Threatened and Endangered Species. Construction activities along the lower American River would adversely affect the valley elderberry longhorn beetle which may inhabit 3 elderberry shrubs in the project footprint. Work to construction the hydraulic mitigation could adversely affect the giant garter snake, delta smelt, and Sacramento splittail. The State-listed Swainson's hawk may also be found in this area. Construction of a new outlet at Folsom would not adversely affect any Federal or State-listed species.

(7) Other Wildlife. Construction of this alternative would affect 6.3 acres of riparian woodland and 1.5 acres of oak woodland. Construction of the hydraulic mitigation would affect 16.4 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields. Construction of a new outlet at Folsom Dam would not affect any wildlife species.

(8) Actions to Minimize Impacts. Potential effects to general wildlife and special status species along the lower American River would be mitigated by developing 6 acres of riparian woodland at an appropriate site such as Mississippi Bar, and 5.4 acres of oak woodland at Rossmoor Bar. Mitigation for the 3 elderberry shrubs would be included in the riparian and oak woodland plantings.

Construction of the hydraulic mitigation features would result in the loss of 16.6 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields. Construction of the hydraulic mitigation features could adversely affect the Federally listed giant garter snake, delta smelt, and Sacramento splittail as well as the State listed Swainson's hawk. Mitigation would consist of creating 18 acres of riparian woodland, and 17.7 acres of oak woodland on Egbert Tract. To mitigate for adverse effects to Federally listed species, a total of 141 acres of wetlands would be developed at Egbert Tract. Mitigation for the State listed Swainson's hawk would consist of a buffer of up to 1/2 mile around any active nest site.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. The work would be done in an area that is isolated from river currents.

(2) Determination of Compliance with Applicable Water Quality Standards. Water-quality management by the Central Valley Regional Water Quality Control Board includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. Beneficial uses of Folsom Reservoir and the lower American River includes municipal and industrial supply, irrigation, power, water contact and non-contact recreation, warm and cold freshwater habitat, warm freshwater spawning habitat, and wildlife habitat. The standards for these uses will not be violated since best management practices would be employed to limit turbidity and sediment transport.

(3) Potential Effects on Human Use Characteristics

*a. Municipal and Private Water Supply*. The work under this alternative would not affect any municipal or private water supply. New irrigation ditches would be constructed prior to filling the existing ditches. Water Districts that depend on Folsom Reservoir would not be affected by construction of a new outlet at the dam.

*b. Recreational and Commercial Fisheries.* Commercial and recreational fisheries would not be affected by the work under this alternative.

*c. Water Related Recreation*. Work under this alternative would not affect water related recreation. No reservoir related changes to Folsom Reservoir are expected from construction of a new outlet and the work would be confined to an area behind the buoy line.

*d. Aesthetics.* The aesthetics of the local area would not be affected. Following construction the area would appear much as it does today.

*e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves*. None of these types of resources would be affected by this work.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The construction activities under this alternative would result less-than-significant adverse effects on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The proposed activities would not result in secondary impacts to the aquatic ecosystem in the region.

# American River Watershed, California
# Long-Term Study

# 404(b)(1) Water Quality Evaluation
# Stepped Release to 180,000 cfs

**AMERICAN RIVER WATERSHED, CALIFORNIA**
**LONG-TERM STUDY**

# 404(b)(1) WATER QUALITY EVALUATION
# STEPPED RELEASE TO 180,000 CFS

## I. PROJECT DESCRIPTION

### LOCATION

The project alternatives are located in the American river Basin and include Folsom Dam and Reservoir and the land areas immediately adjacent to the reservoir, Lake Natoma, the lower American River channel, the Sacramento and Yolo Bypasses and associated sloughs along the lower Sacramento River.

### GENERAL DESCRIPTION

For the purposes of this project, a variety of potential flood control measures were evaluated, and seven action alternatives were created for detailed evaluation along with the No-Action Alternative. The action alternatives being carried forward are: (1) 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, (2) Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, (3) Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation, (4) Stepped Release to 160,000 cfs, (5) Stepped Release to 160,000 cfs and New Outlet at Folsom Dam, (6) Stepped Release to 180,000 cfs, and (7) Stepped Release to 160,000 cfs and Seven-Foot Dam Raise. The Stepped Release to 180,000 cfs is presented here.

### STEPPED RELEASE TO 180,000 CFS

- Raise 13.5 miles of Federal and non-Federal levees along the right and left bank of the lower American River by an average of 2 feet on the waterside. Total impact area is 30 feet from the existing toe (10-feet for the new levee base, 10-feet for a permanent easement, and 10-feet for a temporary construction easement).

- Strengthen 1.1 miles of existing levees with a slurry wall, near river mile 13. Total impact area of 20 feet waterside (10-foot permanent easement, 10-foot temporary construction easement).

- Construct stability berm and lengthen levee slope on right bank from Sacramento River to the NEMDC. Stability berm is 7-feet high and would extend 15 feet on the landside. Construction impact area is 40 feet from the existing toe (15 feet permanent impact and a 25 foot construction easement.

- Erosion protection along 5.8 miles of the levee slopes.

- Construct 2 miles of new levees. New levees would be about 5 feet tall. Total impact area of new levees is 75 feet, which includes a 10-foot wide permanent easement on both the land and waterside.

- Construct 1.7 miles of floodwalls. New floodwalls constructed around Goethe Park (3-foot high) and Nimbus Hatchery (2-foot high). Total impact area at Goethe would be 16-feet which includes a 10-foot permanent easement. Total impact area at Nimbus would be 15-feet which includes a 10-foot permanent easement.

- Raise Howe Avenue Bridge 5.3 feet. To minimize traffic impacts the bridge would be replaced with a new structure at a higher elevation. No lanes would be closed during construction. This raise will include major modifications to bridges over University Avenue, and La Riviera Drive which are on the approaches to Howe Avenue Bridge.

- Modify UP Railroad Trestle, about 2.5 miles upstream of the NEMDC. A flood gate would be constructed where the track crosses the north levee below the levee crown.

- Raise the Guy West pedestrian bridge 3 feet. Foot and bicycle traffic would be rerouted to H Street Bridge.

- Modify interior drainage features along the lower American River. Utility relocations are as described above.

- Construct hydraulic mitigation features as described below.

**Hydraulic Mitigation**

- Work along the right bank of the Yolo Bypass will be slurry wall construction. No additional fill material will be needed for this work. A temporary construction easement would be acquired from the levee toe 100 feet to the landside. Work within this easement will include all staging and slurry batch mixing activities. Table 1 shows the location of slurry wall work. The irrigation drainage ditch that is located landside of the levee would be protected in place by placing pre-cast double T's across the ditch. For impact analysis purposes we assumed a worst case scenario where 1/2 of the linear length of the ditch would be encased with the pre-cast double T's. Construction of the slurry wall could be completed in 2 years.

Table 1

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 49.4 | 60 | 6,000 |
| 47.2 | 60 | 6,000 |
| 44.9 | 40 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from levee crest

- Work in Index Area 3 will consist of both slurry wall work (Table 2), and a combination of seepage/stability berms (Tables 3 and 4). Slurry wall work in this area would proceed as described above.

Table 2

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 23.3 | 60 | 6,000 |
| 22.1 | 70 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from crest

For alternative B, the impact assessment is based on a total of 80-feet from the levee toe (60-foot permanent easement and a 20-foot temporary construction easement).

For alternative C, the impact assessment is based on a total of 55-feet from the levee toe (35-foot permanent easement and 20 foot temporary construction easement).

For alternative C-1, the impact assessment is based on a 35-foot permanent impact for the drainage collector system. The area between the levee toe and the existing drainage ditch would be used for staging.

For alternative D, the impact assessment is based on a total of 45-feet from the levee toe (25-foot permanent easement and 20-foot temporary easement).

A distance of 15-feet from the levee crown to the levee toe is the potential impact area on all levees to be modified.

To construct the sites identified in tables 3 and 4, a total of 154,000 cubic yards of earth fill are needed. This borrow material will be obtained from the Grand Island dredge disposal area. Access between Grand Island and the individual sites will be on the existing levee roads. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

In areas where the landside work would extend into a nearby ditch construction would proceed by placing drain rock into the ditch to form a working surface, and then building up with soil to create the berm.

Eight staging areas have been identified. These sites would be 300-feet by 500-feet in size. All of the staging areas are on agricultural land, seven are located in row crops and one is on orchard.

Construction of sites in Index Area 3 would take approximately 2 years.

**Table 3**

| River or Slough | Site # | LM/ Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Steamboat | 501-00-1 | 1.62/ Right | Boils | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Sutter | 349-00-1 | 2.39/ Left | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. C - 25' Wide x 600' Long) & (Alt. C1 - 25' Wide x 730' Long) |
| Steamboat | 3-00-1 | 3.1/ Left | Slumping | Seepage/Stability Berm (Alt. D - 12' Wide x 1,500' Long) |
| Sacramento | 3-00-6 | 8.09- 8.15/ Right | Boils | Seepage/Stability Berm (Alt. D - 12' Wide x 1,000' Long) |

**Table 4**

| River or Slough | Site # | 1993 Report Figure/Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Sutter | 349-1 | Fig 4 / Left | Boils | Stability Berm (Alt. C - 25' Wide x 1,500' Long) |
| Steamboat | 501-8 | Fig 4 / Right | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. B - 45' Wide x 2,000' Long) |
| Steamboat | 501-9 | Fig 4 / Right | Slumping | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Steamboat | 3-2 | Fig 4 / Left | Stability | Stability Berm (Alt. D - 12' Wide x 8,000' Long) |
| Steamboat | 3-3 | Fig 4 / Left | Seepage | Seepage Berm (Alt. C – 25' Wide x 300' Long) |
| Cache | 501-1A | Fig 4 / Left | Stability/ Seepage | Stability/ Seepage Berm (Alt. B – 45' Wide x 1,200' Long) |
| Cache | 2098-10 | Fig 4 / Left | Stability | Stability Berm (Alt D – 12' Wide x 2,500' Long) |
| Cache | 2098-10A | Fig 4 / Left | Stability/ Seepage | Stability/ Seepage Berm (Alt C-1 – 25' Wide x 400' Long) |
| Yolo Bypass | 2068-1 | Fig 3 / Right | Stability | Stability Bern (Alt D – 12' Wide x 2,500' Long) |
| Yolo Bypass | 2068-2 | Fig 3 / Right | Stability | Stability Berm (Alt D – 12' Wide x 10,000' Long) |

- The fix for work along the left levee of the Yolo Bypass will consist of lime treatment. The length of levee improvements extends about 6 miles along the left bank of the Yolo Bypass from I-5 downstream to the north levee of the Sacramento Bypass. Construction will consist of stripping and stockpiling the topsoil on the levee crown and landside levee slope. About 4 feet of levee material would then be excavated and mixed with lime. A wet lime would be used to reduce the dust. The levee would be reconstructed using the soil/lime mixture. The stockpiled topsoil would then be placed back on the levee crown and landside slope. In addition, the existing ditch would be relocated a maximum of about 140 feet from the existing toe. The total impact area would extend 150 feet from the levee toe. This will allow 140 feet for staging and ditch relocation and 10-feet for a temporary construction easement on the other side of the ditch. Construction of Index Area 1L will take about 2 years.

- Relocation of the north levee of the Sacramento Bypass. The Sacramento Weir would be lengthened 1,000 feet and the bypass would be widened an equal amount. This widening was sized to accommodate an objective release of 145,000 cfs. About 1/3 of the existing north levee would be used to construct the new levee 1,000 feet to the north (about 7.8 acres of borrow material). The rest of the existing north levee would be graded and seeded to provide mounds for wildlife habitat. The remainder of the fill material needed for levee construction would be obtained from the Port of Sacramento.

  The new weir would have the same configuration and section as the existing weir. The new weir would consist of 25 forty-foot-wide bays and will be located to the north of the existing weir along the alignment of the railroad line. A temporary railroad line and road would be constructed that bypass the weir construction. The temporary railroad alignment uses 750-foot radii with transition segments. The speed of the train would be about 15 mph on the temporary bypass. The Sacramento River Road would be connected along a new alignment to the existing road after passing over the new weir. Upon completion of construction of the new weir, the temporary railroad and road bypass would be removed. A total of 5.15 acres of oak woodland would be lost from relocation and construction of the new levee.

  In addition, there is an old landfill that would have to be removed when the bypass is widened. The landfill occupies about 20 acres of land and averages about 5 feet in depth. Two agricultural pumping plants and a gaging station would be relocated, along with four buildings. The cover type at this landfill is upland herbaceous.

AUTHORITY AND PURPOSE

The basic authority for the overall study is the Flood Control Act of 1962 (Public Law [PL] 87-874), as follows:

> The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and flood aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multipurpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85-500.

Although this authorization applies to the overall study of the American River watershed, specific direction for the current effort is provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (PL 106-53):

**SEC. 566. FOLSOM DAM AND RESERVOIR ADDITIONAL STORAGE AND ADDITIONAL FLOOD CONTROL STUDIES**

(a) FOLSOM FLOOD CONTROL STUDIES-

(1) IN GENERAL - The Secretary, in consultation with the State of California and local water resources agencies, shall undertake a study of increasing surcharge flood control storage at Folsom Dam and Reservoir.

(2) LIMITATIONS - The study of the Folsom Dam and Reservoir undertaken under paragraph (1) shall assume that there is to be no increase in conservation storage at the Folsom Reservoir.

(3) REPORT - Not later than March 1, 200, the Secretary shall transmit to Congress a report on the results of the study under this subsection.

(b) AMERICAN AND SACRAMENTO RIVERS FLOOD CONTROL STUDY -

(1) IN GENERAL - The Secretary shall undertake a study of all levees on the American River and on the Sacramento River downstream and immediately upstream of the confluence of such Rivers to assess opportunities to increase potential flood protection through levee modification.

(2) DEADLINE FOR COMPLETION - Not later than March 1, 2000, the Secretary shall transmit to Congress a report on the results of the study undertaken under this subsection.

Flood control alternatives considered in this study focus on increasing Folsom Dam flood control storage, modifying lower American River and downstream levees, and a combination of modifying lower American River and downstream levees and increasing Folsom Dam storage.

GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

Levee modifications along the lower American River and in the hydraulic mitigation areas would be accomplished using material similar to that which was used to construct the existing levees. Several borrow sites have been identified as the source of fill material. Two sites, 52 acres and 72 acres, are located adjacent to each other near Lake Washington in West Sacramento. These are the primary borrow sites for levee work on the lower American River, and for constructing the new north levee of the Sacramento River. An additional borrow site is located between Bradshaw Road and Happy Lane. This site is approximately 64 acres. Fill material needed to construct the hydraulic mitigation sites will be obtained from the Grand Island dredge disposal area. A total of 154,000 cubic yards of material for the hydraulic mitigation work is needed. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

DESCRIPTION OF PROPOSED DISCHARGE SITE(S)

(1) Location. The proposed discharge sites are located along the lower American River, north of the Sacramento Bypass, and along levees of the Yolo Bypass and associated sloughs.

(2) Size. Levee modification along the lower American River includes 13.5 miles of levee raising, 1.1 miles of levee strengthening, 5.8 miles of erosion protection on the levee slope, 2 miles of new levees, and 1.7 miles of floodwalls. In addition, Howe Avenue Bridge and Guy

West Bridge would be raised, and the Union Pacific Railroad Trestle would be modified. Hydraulic mitigation work consists of about 19 miles of work as described in the tables above.

(3) Type of Site. All of the work along the lower American River and along the Yolo Bypass would occur in areas that have been developed as flood control levees for at least 40 years.

(4) Type(s) of Habitat. This work will be accomplished in a variety of cover types including riparian, oak woodland, freshwater emergent marsh, open water, rice, and grassland.

(5) Timing and Duration of Discharge. Work along the lower American River and the hydraulic mitigation sites would be constructed during the spring and summer dry season, typically from May through October. It is estimated that work on the lower American River could be completed in 2 years, while the hydraulic mitigation would take 6 years to complete.

DESCRIPTION OF DISPOSAL METHOD

Levee modifications would generally entail removing topsoil and organic material, and placing the fill material to create a berm or modify the levee slope. For the hydraulic mitigation areas drainage ditches would be relocated and some in-water work would be needed to construct stability berms. Where slurry wall work encroaches on drainage ditches along the Yolo Bypass, precast double T's would be used to protect the ditch in place and provide a working platform. In areas where in-water work is needed the following precautions would be taken:

- Coffer dams will be used for in-water construction. Water will be removed and routed to either 1) sedimentation pond located on a flat stable area that will prevent silt-laden water from reentering the river, ditch, or reservoir.

- A qualified biologist will examine the coffer dam prior to dewatering. If determined to be appropriate by the biologist, a fish salvage program will be conducted prior to complete dewatering. The rescued fish will be released downstream of the construction site.

- Construction areas in the Sacramento and Yolo Bypasses will be graded to slope back into the bypass drainage system to provide passage and escape for fish.

## II. FACTUAL DETERMINATIONS

### a. Physical Substrate Determinations

(1) Substrate Elevation and Slope. Work along the lower American River would be accomplished in both upland and wetland areas. Construction of the hydraulic mitigation could affect some wetland areas. Following construction these areas would be graded to pre-project conditions and the areas would be stabilized using hydroseeding methods after construction is complete.

(2) Sediment Type. The sediment type will be similar to that found in the project area now.

(3) Dredged/Fill Material Movement. Material used to reconstruct levees would be compacted in place. These areas would be stabilized using hydroseeding methods after construction is complete and would not erode into any drainage or irrigation ditches nearby.

(4) Physical Effects on Benthos. The benthic community in the immediate area of the work areas around the bridges and drainage ditches that need to be relocated would be disturbed. The benthic community would reestablish itself following construction of the new drainage ditch. Best management practices would be implemented to minimize disturbance to the benthic community in the vicinity of the bridge raising.

(5) Other Effects. Not Applicable.

(6) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method".

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water. Construction along the lower American River, and along the Yolo Bypass and sloughs could result in short term increases of sediment loads in drainage or irrigation canals near the work sites.

(2) Current Patterns and Circulation. Where drainage ditches need to be relocated, the new ditch would be constructed prior to filling the existing ditch. Current patterns and circulation would not be affected by the work.

(3) Normal Water Level Fluctuations. None of the work would affect normal water level fluctuations.

(4) Salinity Gradients. Not applicable, the American River is a fresh water system.

(5) Actions That Will Be Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under “Description of Disposal Method”.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Short-term increases in turbidity may be seen where in-water work is needed to construct stability berms along the Yolo Bypass and in the lower American River near the Howe Avenue and Guy West Bridges.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - light penetration, dissolved oxygen, toxic metals and organics, pathogens, aesthetics, others as appropriate. The activities under this alternative would not substantially change the physical and chemical properties of the water column.

(3) Effects on Biota. See discussion under Aquatic Ecosystem and Organism Determinations below.

(4) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method".

d. Contaminant Determinations. There would be no contaminants introduced into the aquatic environment as a result of the levee stabilization work because all borrow material would be secured from a borrow source certified as being free from contaminants.

e. Aquatic Ecosystem and Organism Determination

(1-4) Effects on plankton, benthos, nekton, and the aquatic food web. The benthic community existing in the drainage ditches and the streambed would be temporarily disturbed by relocation. Following construction, the benthic community would reestablish.

(5) Effects on Special Aquatic Sites. The proposed action would not affect any special aquatic sites. There are no special aquatic sites at the sediment removal site.

(6) Threatened and Endangered Species. Construction activities along the lower American River would adversely affect the valley elderberry longhorn beetle which may inhabit 137 elderberry shrubs in the project footprint. Work to construction the hydraulic mitigation could adversely affect the giant garter snake, delta smelt, and Sacramento splittail. The State-listed Swainson's hawk may also be found in this area.

(7) Other Wildlife. Construction of this alternative would affect 31.8 acres of riparian woodland and 20.1 acres of oak woodland. Construction of the hydraulic mitigation would affect 16.4 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields.

(8) Actions to Minimize Impacts. Potential effects to general wildlife and special status species along the lower American River would be mitigated by developing 49.8 acres of riparian woodland at an appropriate site such as Mississippi Bar, and 70.9 acres of oak woodland at Rossmoor Bar. Mitigation for the 137 elderberry shrubs would be included in the riparian and oak woodland plantings.

Construction of the hydraulic mitigation features would result in the loss of 16.6 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields. Construction of the hydraulic mitigation features could adversely affect the Federally listed giant garter snake, delta smelt, and Sacramento splittail as well as the State listed Swainson's hawk. Mitigation would consist of creating 18 acres of riparian woodland, and 17.7 acres of oak woodland on Egbert Tract. To mitigate for adverse effects to Federally listed species, a total of 141 acres of wetlands would be developed at Egbert Tract. Mitigation for the State listed Swainson's hawk would consist of a buffer of up to 1/2 mile around any active nest site.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. A portion of the work Howe Avenue and Guy West Bridge raising would be constructed in the streambed.

(2) Determination of Compliance with Applicable Water Quality Standards. Water-quality management by the Central Valley Regional Water Quality Control Board includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. Beneficial uses of the lower American River includes municipal and industrial supply, irrigation, power, water contact and non-contact recreation, warm and cold freshwater habitat, warm freshwater spawning habitat, and wildlife habitat. The standards for these uses will not be violated since best management practices would be employed to limit turbidity and sediment transport.

(3) Potential Effects on Human Use Characteristics

*a. Municipal and Private Water Supply*. The work under this alternative would not affect any municipal or private water supply. New irrigation ditches would be constructed prior to filling the existing ditches.

*b. Recreational and Commercial Fisheries.* Commercial and recreational fisheries would not be affected by the work under this alternative. Precautions would be taken to minimize effects to fisheries in the lower American River by requiring coffer dams for any in-water work.

*c. Water Related Recreation*. Work under this alternative would not affect water related recreation

*d. Aesthetics.* The aesthetics of the local area would not be affected. Following construction the area would appear much as it does today.

*e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves.* None of these types of resources would be affected by this work.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The construction activities under this alternative would result less-than-significant adverse effects on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The proposed activities would not result in secondary impacts to the aquatic ecosystem in the region.

# American River Watershed, California
# Long-Term Study

# 404(b)(1) Water Quality Evaluation
# Stepped Release to 160,000 cfs and
# Seven-Foot Dam Raise/482-Foot Elevation

**AMERICAN RIVER WATERSHED, CALIFORNIA**
**LONG-TERM STUDY**

# 404(b)(1) WATER QUALITY EVALUATION
# STEPPED RELEASE TO 160,000 CFS AND
# SEVEN-FOOT DAM RAISE/482-FOOT ELEVATION

## I. PROJECT DESCRIPTION

### LOCATION

The project alternatives are located in the American river Basin and include Folsom Dam and Reservoir and the land areas immediately adjacent to the reservoir, Lake Natoma, the lower American River channel, the Sacramento and Yolo Bypasses and associated sloughs along the lower Sacramento River.

### GENERAL DESCRIPTION

For the purposes of this project, a variety of potential flood control measures were evaluated, and seven action alternatives were created for detailed evaluation along with the No-Action Alternative. The action alternatives being carried forward are: (1) 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, (2) Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, (3) Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation, (4) Stepped Release to 160,000 cfs, (5) Stepped Release to 160,000 cfs and New Outlet at Folsom Dam, (6) Stepped Release to 180,000 cfs, and (7) Stepped Release to 160,000 cfs and Seven-Foot Dam Raise. The Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation is presented here.

### STEPPED RELEASE TO 160,000 CFS

- Construct a 7-foot high stability berm and lengthen the levee slope from the Sacramento River to the Natomas East Main Drainage Canal. Reshape about 400 feet of the landside levee slope in this reach.

- Erosion protection placed along 5.8 miles of levee slopes so they can withstand the higher flow velocities.

- Modify interior drainages.

- Construct hydraulic mitigation features as described below.

**Hydraulic Mitigation**

- Work along the right bank of the Yolo Bypass will be slurry wall construction. No additional fill material will be needed for this work. A temporary construction easement

would be acquired from the levee toe 100 feet to the landside. Work within this easement will include all staging and slurry batch mixing activities. Table 1 shows the location of slurry wall work. The irrigation drainage ditch that is located landside of the levee would be protected in place by placing pre-cast double T's across the ditch. For impact analysis purposes we assumed a worst case scenario where 1/2 of the linear length of the ditch would be encased with the pre-cast double T's. Construction of the slurry wall could be completed in 2 years.

Table 1

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 49.4 | 60 | 6,000 |
| 47.2 | 60 | 6,000 |
| 44.9 | 40 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from levee crest

- Work in Index Area 3 will consist of both slurry wall work (Table 2), and a combination of seepage/stability berms (Tables 3 and 4). Slurry wall work in this area would proceed as described above.

Table 2

| Midpoint of Wall [a] (River Mile) | Slurry Wall (width = 3 feet) | |
|---|---|---|
| | Depth [b] (feet) | Length (feet) |
| 23.3 | 60 | 6,000 |
| 22.1 | 70 | 6,000 |

[a] for example, wall extends 3,000' upstream and 3,000' downstream of midpoint
[b] from crest

For alternative B, the impact assessment is based on a total of 80-feet from the levee toe (60-foot permanent easement and a 20-foot temporary construction easement).

For alternative C, the impact assessment is based on a total of 55-feet from the levee toe (35-foot permanent easement and 20 foot temporary construction easement).

For alternative C-1, the impact assessment is based on a 35-foot permanent impact for the drainage collector system. The area between the levee toe and the existing drainage ditch would be used for staging.

For alternative D, the impact assessment is based on a total of 45-feet from the levee toe (25-foot permanent easement and 20-foot temporary easement).

A distance of 15-feet from the levee crown to the levee toe is the potential impact area on all levees to be modified.

To construct the sites identified in tables 3 and 4, a total of 154,000 cubic yards of earth fill are needed. This borrow material will be obtained from the Grand Island dredge disposal

area. Access between Grand Island and the individual sites will be on the existing levee roads. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

In areas where the landside work would extend into a nearby ditch construction would proceed by placing drain rock into the ditch to form a working surface, and then building up with soil to create the berm.

Eight staging areas have been identified. These sites would be 300-feet by 500-feet in size. All of the staging areas are on agricultural land, seven are located in row crops and one is on orchard.

Construction of sites in Index Area 3 would take approximately 2 years.

**Table 3**

| River or Slough | Site # | LM/ Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Steamboat | 501-00-1 | 1.62/ Right | Boils | Seepage/Stability Berm (Alt. B - 45' Wide x 2500' Long) |
| Sutter | 349-00-1 | 2.39/ Left | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. C - 25' Wide x 600' Long) & (Alt. C1 - 25' Wide x 730' Long) |
| Steamboat | 3-00-1 | 3.1/ Left | Slumping | Seepage/Stability Berm (Alt. D - 12' Wide x 1,500' Long) |
| Sacramento | 3-00-6 | 8.09- 8.15/ Right | Boils | Seepage/Stability Berm (Alt. D - 12' Wide x 1,000' Long) |

**Table 4**

| River or Slough | Site # | 1993 Report Figure/Bank | Failure Condition | Recommended Fix |
|---|---|---|---|---|
| Sutter | 349-1 | Fig 4 / Left | Boils | Stability Berm (Alt. C - 25' Wide x 1,500' Long) |
| Steamboat | 501-8 | Fig 4 / Right | Boils & Seepage | Stability Berm/ Toe French Drain (Alt. B - 45' Wide x 2,000' Long) |
| Steamboat | 501-9 | Fig 4 / Right | Slumping | Seepage/Stability Berm (Alt. B - 45' Wide x 2,500' Long) |
| Steamboat | 3-2 | Fig 4 / Left | Stability | Stability Berm (Alt. D - 12' Wide x 8,000' Long) |
| Steamboat | 3-3 | Fig 4 / Left | Seepage | Seepage Berm (Alt. C – 25' Wide x 300' Long) |
| Cache | 501-1A | Fig 4 / Left | Stability/ Seepage | Stability/ Seepage Berm (Alt. B – 45' Wide x 1,200' Long) |
| Cache | 2098-10 | Fig 4 / Left | Stability | Stability Berm (Alt D – 12' Wide x 2,500' Long) |
| Cache | 2098-10A | Fig 4 / Left | Stability/ Seepage | Stability/ Seepage Berm (Alt C-1 – 25' Wide x 400' Long) |
| Yolo Bypass | 2068-1 | Fig 3 / Right | Stability | Stability Bern (Alt D – 12' Wide x 2,500' Long) |
| Yolo Bypass | 2068-2 | Fig 3 / Right | Stability | Stability Berm (Alt D – 12' Wide x 10,000' Long) |

- The fix for work along the left levee of the Yolo Bypass will consist of lime treatment. The length of levee improvements extends about 6 miles along the left bank of the Yolo Bypass from I-5 downstream to the north levee of the Sacramento Bypass. Construction will consist of stripping and stockpiling the topsoil on the levee crown and landside levee slope. About 4 feet of levee material would then be excavated and mixed with lime. A wet lime would be used to reduce the dust. The levee would be reconstructed using the soil/lime mixture. The stockpiled topsoil would then be placed back on the levee crown and landside slope. In addition, the existing ditch would be relocated a maximum of about 140 feet from the existing toe. The total impact area would extend 150 feet from the levee toe. This will allow 140 feet for staging and ditch relocation and 10-feet for a temporary construction easement on the other side of the ditch. Construction of Index Area 1L will take about 2 years.

- Relocation of the north levee of the Sacramento Bypass. The Sacramento Weir would be lengthened 1,000 feet and the bypass would be widened an equal amount. This widening was sized to accommodate an objective release of 145,000 cfs. About 1/3 of the existing north levee would be used to construct the new levee 1,000 feet to the north (about 7.8 acres of borrow material). The rest of the existing north levee would be graded and seeded to provide mounds for wildlife habitat. The remainder of the fill material needed for levee construction would be obtained from the Port of Sacramento.

  The new weir would have the same configuration and section as the existing weir. The new weir would consist of 25 forty-foot-wide bays and will be located to the north of the existing weir along the alignment of the railroad line. A temporary railroad line and road would be constructed that bypass the weir construction. The temporary railroad alignment uses 750-foot radii with transition segments. The speed of the train would be about 15 mph on the temporary bypass. The Sacramento River Road would be connected along a new alignment to the existing road after passing over the new weir. Upon completion of construction of the new weir, the temporary railroad and road bypass would be removed. A total of 5.15 acres of oak woodland would be lost from relocation and construction of the new levee.

  In addition, there is an old landfill that would have to be removed when the bypass is widened. The landfill occupies about 20 acres of land and averages about 5 feet in depth. Two agricultural pumping plants and a gaging station would be relocated, along with four buildings. The cover type at this landfill is upland herbaceous.

  SEVEN-FOOT DAM RAISE/482-FOOT FLOOD POOL ELEVATION

  - Raise dam crest and construct a 3.5-foot parapet wall.

  - Replace all eight spillway gates.

  - Extend and strengthen the existing spillway bridge piers.

  - Replace the spillway bridge with one lane of traffic in each direction.

- Extend the stilling basin by 60 feet.
- Raise embankment dams and dikes.
- Modify the elevator tower.
- Enlarge L. L. Anderson Dam spillway.
- Construct a temporary construction bridge downstream of the dam. Following construction traffic would be routed back to the dam road at the discretion of the Bureau, and the temporary construction bridge would be removed.
- Borrow -750,000 cubic yards of borrow from the Peninsula site, and 675,000 cubic yards of material from the Mississippi Bar site.

AUTHORITY AND PURPOSE

The basic authority for the overall study is the Flood Control Act of 1962 (Public Law [PL] 87-874), as follows:

> The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and flood aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multipurpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85-500.

Although this authorization applies to the overall study of the American River watershed, specific direction for the current effort is provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (PL 106-53):

**SEC. 566. FOLSOM DAM AND RESERVOIR ADDITIONAL STORAGE AND ADDITIONAL FLOOD CONTROL STUDIES**

(a) FOLSOM FLOOD CONTROL STUDIES-

(1) IN GENERAL - The Secretary, in consultation with the State of California and local water resources agencies, shall undertake a study of increasing surcharge flood control storage at Folsom Dam and Reservoir.

(2) LIMITATIONS - The study of the Folsom Dam and Reservoir undertaken under paragraph (1) shall assume that there is to be no increase in conservation storage at the Folsom Reservoir.

(3) REPORT - Not later than March 1, 200, the Secretary shall transmit to Congress a report on the results of the study under this subsection.

(b) AMERICAN AND SACRAMENTO RIVERS FLOOD CONTROL STUDY -

(1) IN GENERAL - The Secretary shall undertake a study of all levees on the American River and on the Sacramento River downstream and immediately upstream of the confluence of such Rivers to assess opportunities to increase potential flood protection through levee modification.
(2) DEADLINE FOR COMPLETION - Not later than March 1, 2000, the Secretary shall transmit to Congress a report on the results of the study undertaken under this subsection.

Flood control alternatives considered in this study focus on increasing Folsom Dam flood control storage, modifying lower American River and downstream levees, and a combination of modifying lower American River and downstream levees and increasing Folsom Dam storage.

GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

Levee modifications along the lower American River and in the hydraulic mitigation areas would be accomplished using material similar to that which was used to construct the existing levees. Several borrow sites have been identified as the source of fill material. Two sites, 52 acres and 72 acres, are located adjacent to each other near Lake Washington in West Sacramento. These are the primary borrow sites for levee work on the lower American River, and for constructing the new north levee of the Sacramento River. An additional borrow site is located between Bradshaw Road and Happy Lane. This site is approximately 64 acres. Fill material needed to construct the hydraulic mitigation sites will be obtained from the Grand Island dredge disposal area. A total of 154,000 cubic yards of material for the hydraulic mitigation work is needed. An additional 59,480 cubic yards of drain rock will be obtained from commercial sources.

At Folsom Dam, construction of this alternative would be accomplished primarily in upland areas. A total 750,000 cubic yards of borrow material would be needed for the Seven-Foot Raise. This material would be used for enlarging the embankment dams and dikes and constructing the temporary construction bridge would be placed. Fill material would be excavated from the reservoir at the Peninsula site, and also from Mississippi Bar.

Borrow material from Mississippi Bar would be excavated and transported across Lake Natomas by barge and then hauled by truck up to Folsom Dam. Some dredging or a pier may need to be installed in order to provide barge access at both the loading area and the offloading area at Willow Creek Recreation Area.

DESCRIPTION OF PROPOSED DISCHARGE SITE(S)

(1) Location. The proposed discharge sites are located along the lower American River, north of the Sacramento Bypass, and along levees of the Yolo Bypass and associated sloughs, and in the immediate vicinity of Folsom Dam.

(2) Size. Levee modification along the lower American River is about 1 mile in length. The work would take place on the landside of the levee. Hydraulic mitigation work consists of about 19 miles of work as described in the tables above. The construction area at Folsom Dam

consists of the top of the dam as well as the embankment dams and dikes, and a temporary construction bridge about 1 mile long.

(3) Type of Site. All of the work along the lower American River, Yolo Bypass, and Folsom Reservoir would occur in areas that have been developed as flood control levees for at least 40 years.

(4) Type(s) of Habitat. This work will be accomplished in a variety of cover types including riparian, oak woodland, freshwater emergent marsh, open water, rice, and grassland.

(5) Timing and Duration of Discharge. Work along the lower American River and the hydraulic mitigation sites would be constructed during the spring and summer dry season, typically from May through October. It is estimated that work on the lower American River could be completed in 2 years, while the hydraulic mitigation would take 6 years to complete. Raising Folsom Dam would also take about 6 years.

DESCRIPTION OF DISPOSAL METHOD

Levee modifications would generally entail removing topsoil and organic material, and placing the fill material to create a berm or modify the levee slope. For the hydraulic mitigation areas drainage ditches would be relocated and some in-water work would be needed to construct stability berms. Where slurry wall work encroaches on drainage ditches along the Yolo Bypass, precast double T's would be used to protect the ditch in place and provide a working platform. In areas where in-water work is needed the following precautions would be taken:

- Coffer dams will be used for in-water construction. Water will be removed and routed to either 1) sedimentation pond located on a flat stable area that will prevent silt-laden water from reentering the river, ditch, or reservoir.

- A qualified biologist will examine the coffer dam prior to dewatering. If determined to be appropriate by the biologist, a fish salvage program will be conducted prior to complete dewatering. The rescued fish will be released downstream of the construction site.

- Construction areas in the Sacramento and Yolo Bypasses will be graded to slope back into the bypass drainage system to provide passage and escape for fish.

Concrete to construct the piers and parapet walls would be trucked on to site using local suppliers from the Bradshaw/Kiefer area. Fill material needed for foundation work would be excavated from both the Peninsula and Mississippi Bar borrow sites. Borrow material would be hauled to the work sites around the reservoir at to the temporary construction bridge site. This material would be compacted into place at the work site.

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope. Work along the lower American River would be accomplished in an upland area. Construction of the hydraulic mitigation could affect some wetland areas. Following construction these areas would be graded to pre-project conditions and the areas would be stabilized using hydroseeding methods after construction is complete. Work at Folsom Dam on the embankment dams and dikes would be accomplished in an upland area. Construction of the temporary construction bridge could affect some riparian areas. Following construction these areas would be graded to pre-project conditions and the area would be stabilized using hydroseeding methods after construction is complete.

(2) Sediment Type. The sediment type will be similar to that found in the project area now.

(3) Dredged/Fill Material Movement. Material used to reconstruct levees along the lower American River and raise embankment dikes at Folsom would be compacted in place. These areas would be stabilized using hydroseeding methods after construction is complete and would not erode into any drainage or irrigation ditches nearby.

(4) Physical Effects on Benthos. The benthic community in the immediate area of drainage ditch relocation associated with the 160 Stepped Release Plan would be removed. This community is probably fairly simple and does not support an extensive or complex aquatic community. The benthic community would reestablish itself following construction of the new drainage ditch. At Folsom, no benthic communities would be affected.

(5) Other Effects. Not Applicable.

(6) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under “Description of Disposal Method”. Best management construction practices will be implemented to minimize potential effects to the reservoir and downstream waters.

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water. Construction work at Folsom Reservoir and along the lower American River, and along the Yolo Bypass and sloughs could result in short term increases of sediment loads in drainage or irrigation canals near the work sites.

(2) Current Patterns and Circulation. Where drainage ditches need to be relocated, the new ditch would be constructed prior to filling the existing ditch. Current patterns and circulation would not be affected by the work. Current patterns and circulation would not be affected by the work at Folsom Reservoir. Construction of the temporary construction bridge would not affect flows in the lower American River.

(3) Normal Water Level Fluctuations. None of the work would affect normal water level fluctuations.

(4) Salinity Gradients. Not applicable, the American River is a fresh water system.

(5) Actions That Will Be Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method". Best management construction practices will be implemented to minimize potential effects to Folsom Reservoir and downstream waters.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. Short-term increases in turbidity may be seen where in-water work is needed to construct stability berms along the Yolo Bypass. Work at Folsom Reservoir does not involve any in-water work and should not result in an increase in turbidity levels.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - light penetration, dissolved oxygen, toxic metals and organics, pathogens, aesthetics, others as appropriate. The activities under this alternative would not substantially change the physical and chemical properties of the water column.

(3) Effects on Biota. See discussion under Aquatic Ecosystem and Organism Determinations below.

(4) Actions Taken to Minimize Impacts. The work has been restricted to the smallest possible area, restricted to the upland area where possible, and restricted to the dry season. In areas where drainage ditches must be relocated, the new ditch will be constructed before the existing ditch is filled. In addition, where in-water work is necessary coffer dams will be used as described under "Description of Disposal Method". Best management construction practices will be implemented to minimize potential effects to Folsom Reservoir and downstream waters.

d. Contaminant Determinations. There would be no contaminants introduced into the aquatic environment as a result of the levee stabilization work because all borrow material would be secured from a borrow source certified as being free from contaminants.

e. Aquatic Ecosystem and Organism Determination

(1-4) Effects on plankton, benthos, nekton, and the aquatic food web. The benthic community existing in the drainage ditches would be temporarily disturbed by relocation. Following ditch relocation, the benthic community would reestablish. Benthic communities at Folsom Reservoir would not be affected.

(5) Effects on Special Aquatic Sites. The proposed action would not affect any special aquatic sites.

(6) Threatened and Endangered Species. Construction activities along the lower American River would adversely affect the valley elderberry longhorn beetle which may inhabit 3 elderberry shrubs in the project footprint. Work to construction the hydraulic mitigation could adversely affect the giant garter snake, delta smelt, and Sacramento splittail. The State-listed Swainson's hawk may also be found in this area. Construction activities at Folsom Reservoir would adversely affect the valley elderberry longhorn beetle which may inhabit 40 elderberry shrubs in the construction footprint.

(7) Other Wildlife. Construction of this alternative would affect 6.3 acres of riparian woodland and 1.5 acres of oak woodland. Construction of the hydraulic mitigation would affect 16.4 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields.

Construction activities at Folsom Reservoir would affect 29.8 acres of oak and pine-oak woodland, 10.3 acres of riparian woodland, and 0.3 acres of seasonal wetland.

(8) Actions to Minimize Impacts. Potential effects to general wildlife and special status species along the lower American River would be mitigated by developing 6 acres of riparian woodland at an appropriate site such as Mississippi Bar, and 5.4 acres of oak woodland at Rossmoor Bar. Mitigation for the 3 elderberry shrubs would be included in the riparian and oak woodland plantings.

Construction of the hydraulic mitigation features would result in the loss of 16.6 acres of riparian woodland, 5.2 acres of oak woodland, 23.2 acres of freshwater marsh, 11.3 acres of open water, and 12.5 acres of rice fields. Construction of the hydraulic mitigation features could adversely affect the Federally listed giant garter snake, delta smelt, and Sacramento splittail as well as the State listed Swainson's hawk. Mitigation would consist of creating 18 acres of riparian woodland, and 17.7 acres of oak woodland on Egbert Tract. To mitigate for adverse effects to Federally listed species, a total of 141 acres of wetlands would be developed at Egbert Tract. Mitigation for the State listed Swainson' hawk would consist of a buffer of up to 1/2 mile around any active nest site.

Mitigation for construction effects from raising Folsom Dam would consist of planting 10.3 acres of riparian woodland and 0.3 acres of seasonal wetland at the Bureau's Mormon Island Wetland Preserve, and planting 79 acres of oak and pine-oak woodland on project land around Folsom Reservoir. A total of 40 elderberry shrubs would be directly impacted from construction. Compensation for these shrubs would be included in the oak woodland plantings around the reservoir.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. The proposed work would be done in an area that is isolated from river currents.

(2) Determination of Compliance with Applicable Water Quality Standards. Water-quality management by the Central Valley Regional Water Quality Control Board includes establishment of beneficial uses and water-quality objectives. Protection and enhancement goals for identified beneficial uses determine the overall water-quality objectives. Beneficial uses of the lower American River includes municipal and industrial supply, irrigation, power, water contact and non-contact recreation, warm and cold freshwater habitat, warm freshwater spawning habitat, and wildlife habitat. The standards for these uses will not be violated since best management practices would be employed to limit turbidity and sediment transport.

(3) Potential Effects on Human Use Characteristics

*a. Municipal and Private Water Supply*. The work under this alternative would not affect any municipal or private water supply. New irrigation ditches would be constructed prior to filling the existing ditches. The work at Folsom Dam would not affect any municipal or private water supply.

*b. Recreational and Commercial Fisheries.* Commercial and recreational fisheries would not be affected by the work under this alternative.

*c. Water Related Recreation*. Work under this alternative would not affect water related recreation

*d. Aesthetics.* The aesthetics of the local area would not be affected. Following construction the area would appear much as it does today.

*e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves*. None of these types of resources would be affected by this work.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The construction activities under this alternative would result less-than-significant adverse effects on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The proposed activities would not result in secondary impacts to the aquatic ecosystem in the region.